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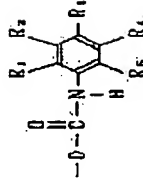
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(54) SUBSTITUTED AROMATIC CARBAMATE DERIVATIVE OF POLYSACCHARIDE, AND
SEPARATING AGENT

(57)Abstract:
PURPOSE: To obtain a compd. useful as the active ingredient of a separating agent usable in separation of various chemical substances, particularly in optical resolution, by choosing a substd. arom. carbamate deriv. of a polysaccharide having a predetermined amt. of the OH groups thereof substd. with specific groups.

CONSTITUTION: Choice is made of a substd. arom. carbamate deriv. of a polysaccharide (e.g. cellulose) having 80-100% of the OH groups thereof substd. with groups of the formula (wherein R1 to R4 are each H, 1-8C alkyl, or a halogen atom, provided that at least two of R1 to R4 are each 1-8C alkyl or a halogen atom, and are different from each other).



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* NOTICES *

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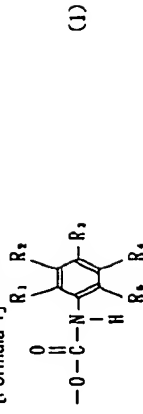
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CLAIMS

[Claim(s)]

[Claim 1] ** [80% of the hydroxyl group which a polysaccharide has cannot be found] 100% is the following general formula (1). Permutation aromatic series carbamate derivative of the polysaccharide permuted by the radical shown.

[Formula 1]



(R1, R2, R3, and R4 and R5 are a **** atom or a carbon number 1 thru/or eight alkyl groups, or a halogen atom among a formula, respectively, and at least two of R1-R5 are a carbon number 1 thru/or the alkyl group of 8, or a halogen atom, and it is a different substituent.)

[Claim 2] General formula (1) Permutation aromatic series carbamate derivative of the polysaccharide according to claim 1 whose at least one it sets, and at least one of R1-R5 is a carbon number 1 thru/or the alkyl group of 8, and is a halogen atom.

[Claim 3] The separating medium which makes an active principle the permutation aromatic series carbamate derivative of a polysaccharide according to claim 1.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Industrial Application] This invention relates to the separating medium which makes an active principle a very useful new polysaccharide derivative and this polysaccharide derivative as a functional material. The separating medium of this invention can be used for separation of various chemicals, especially optical resolution.

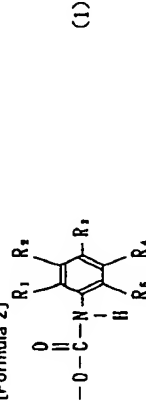
[0002]

[Description of the Prior Art] Even if it is the same compound chemically as known well, the optical isomer usually differs in the operation to a living body. Therefore, in fields, such as physic, agricultural chemicals, and a biochemistry related industry, it has been a very important technical problem to prepare a pure compound optically for improvement in the drug effect per unit, prevention of a side effect and phytotoxicity, etc. By current, the mixture of an optical isomer has been studied about the optical-resolution ability of many polysaccharide derivatives, separation, i.e., in order to carry out optical resolution. For example, cellulose tris phenyl carbamate (J.Am.Chem.Soc., 108, 5357, 1984) Having the optical-resolution ability excellent in the bulking agent for liquid chromatography which makes a stationary phase the alkylation phenyl carbamate derivatives (JP.63-178101.A, JP.1-203402A, etc.) of a polysaccharide and the halogenation aromatic series carbamate derivative (JP.61-233633.A) of a polysaccharide is already known. However, it is a fact that there is a compound which cannot carry out optical resolution even if it uses these polysaccharides derivative, and development of the separating medium which can carry out optical resolution also of such a compound is desired.

[0003]

[Means for Solving the Problem] this invention person etc. came to complete a header and this invention for having the dissymmetry discernment ability excellent in the carbamate derivative of the polysaccharide which has the aromatic series radical which has two or more kinds of different substituents, as a result of advancing research wholeheartedly in order to solve such a technical problem. That is, this invention is ** [80% of the hydroxyl group which a polysaccharide has cannot be found], 100% is the following general formula (1). The separating medium which makes an active principle the permutation aromatic series carbamate derivative of the polysaccharide permuted by the radical shown and the permutation aromatic series carbamate derivative of this polysaccharide is offered.

[0004]
[Formula 2]



[0005] (R1, R2, R3, and R4 are a **** atom or a carbon number 1 thru/or eight alkyl

groups, or a halogen atom among a formula, respectively.) at least two of R1-R5 are a carbon number 1 thru/or the alkyl group of 8, or a halogen atom, and they are a different substituent. It does not ask any of a synthetic polysaccharide, a natural polysaccharide, and a natural conversion polysaccharide they are, but although what kind of thing is sufficient as it as long as the polysaccharide in this invention is optical activity, its desirable regularity of a joint format is high, if it illustrates -- beta-1, 4-glucan (cellulose), alpha-1, and 4-glucan (an amylose --) An amylopectin, alpha-1, 6-glucan, beta-1, 4-galactan, beta-1, 6-glucan (BUSUTSURAN), alpha-1, 6-glucan, beta-1, 3-glucan (for example, curdlan, sizofiran, etc.), alpha-1, 3-glucan, beta-1, 4-galactan, beta-1, 4-mannan, alpha-1, 6-mannan, beta-1, 2-cell tongue (inulin), beta-2, 6-cell tongue (levan). It is beta-1, 4-xylan, beta-1, 4-chitosan, beta-1, 4-N-acetyl chitosan (chitin), a pullulan, agarose, an alginic acid, etc., and the starch containing an amylose etc. is contained. Especially desirable things are beta-1 which can obtain the polysaccharide of a high grade easily. 4-glucan (cellulose), alpha-1, 4-glucan (an amylose, amylopectin), beta-1, 4-chitosan, beta-1, 4-N-acetyl chitosan (chitin), beta-1, 4-mannan, beta-1, 4-xylan, an inulin, curdlan, etc.

[0006] Although the number average degree of polymerization (the number of averages of the pyranose ring contained in a monad or a furanose ring) of these polysaccharides is ten or more preferably and especially an upper limit does not have it five or more It is desirable in the ease of handling that it is 500 or less.

[0007] ** [the carbamoyl group which accomplishes the carbamate derivative of the

polysaccharide of this invention does not have 80% of all the hydroxyl groups that are shown by the above-mentioned general formula (1) and correspond and that a polysaccharide has] The 20 remaining% which is that in which 100% forms this carbamoyl group and the urethane bond thru/or 0%, although it is generally still a hydroxyl group, it is convertible for a substituent besides a part.

[0008] General formula (1) In the radical expressed, R1, R2, R3, and R4 are a **** atom or a carbon number 1 thru/or eight alkyl groups, or a halogen atom, respectively. At least two of R1-R5 are a carbon number 1 thru/or the alkyl group of 8, or a halogen atom, and it is a different substituent, and at least one of R1-R5 is a carbon number 1 thru/or the alkyl group of 8 especially preferably, and at least one is a halogen atom. As a carbon number 1 thru/or eight alkyl groups, a methyl group, an ethyl group, a propyl group, butyl, a hexyl group, an octyl radical, etc. are mentioned, and a chlorine atom, a bromine atom, an iodine atom, etc. are mentioned as a halogen atom.

[0009] The reaction which produces urethane from usual alcohol and isocyanate is applicable to composition of the carbamate derivative in connection with this invention as it is. For example, it can obtain by making corresponding isocyanate and a corresponding polysaccharide react in a suitable solvent by making Lewis acid, such as Lewis bases, such as the third class amine, or a tin compound, into a catalyst. Moreover, composition of isocyanate is easily compoundable by, for example, making a phosgene act on the amino group of a corresponding aniline derivative. [0010] The polysaccharide carbamate derivative of this invention is the matter very useful as a functional material, and is especially useful as a separating medium for optical resolution. It is also possible to support on the film otherwise and to carry out membrane separation by making the polysaccharide carbamate derivative of this invention into a separating medium, although it is common to use chromatography methods, such as a gas chromatography, liquid chromatography, thin-layer chromatography, and supercritical chromatography, in order to use it for the purpose which separates a compound and an optical isomer.

[0011] Although the method of forming a capillary tube and using the wall by the approach of filling up a column as fine particles, the approach of coating a capillary column, and this separating medium etc. is taken in order to apply to a liquid chromatography method by making the polysaccharide carbamate derivative of this invention into a separating medium, considering as fine particles is common, although the magnitude of a particle with desirable making into the shape of a bead whether to grind this changes with magnitude of the column to be used in order to make this separating medium into fine particles -- 1 micrometer -- 10mm -- it is -- desirable -- 1 micrometer -- 300 mum it is -- as for a particle, it is desirable that it is porously.

[0012] Furthermore, it is desirable to make this separating medium hold to support for

improvement in the proof-pressure capacity of a separating medium, swelling by the solvent permutation, prevention of contraction, and improvement in the theoretical plate number. although the magnitude of support changes with the magnitude of the column to be used or a plate -- general -- 1 micrometer -- 10mm -- it is -- desirable -- 1 micrometer -- 300 mm it is -- support is porosity -- desirable -- an average aperture -- 10A-100 mm it is -- it is 50A-50000 ** preferably. The amount which makes this separating medium hold is 5 - 50 % of the weight preferably one to 100% of the weight to support.

[0013] As an approach of making support supporting a polysaccharide derivative, the chemical approach or a physical method may be used. In case a polysaccharide is derivatized as a chemical approach, some hydroxyl groups are protected, after derivatization, deprotection is carried out and there is a method of combining this and silica gel chemically (Y.Okamoto et al., J.Liq.Chromatogr., 10 (389), 1613, 1987), as a physical method, a polysaccharide derivative is dissolved in the solvent of fusibility -- making -- support -- good -- mixing -- warming under reduced pressure -- there is a method of making a solvent distill off by the bottom or the bottom of an air current etc.

[0014] As support, there is porous organic support or porous inorganic support, and it is porous inorganic support preferably. The high polymer which a thing suitable as porous organic support becomes from polystyrene, polyacrylamide, polyacrylate, etc. is mentioned. The composition or the natural matter like a silica, an alumina, a magnesia, titanium oxide, glass, a silicate, and a kaolin is mentioned, and a thing suitable as porous inorganic support has silanizing processing using the organic silane compound as the approach of surface treatment, a surface treatment method by the plasma polymerization, etc. for performing surface treatment, in order to improve compatibility with a polysaccharide derivative.

[0015] Although there is no constraint if a reactant liquid is removed when there is especially no constraint as an eluate in the case of performing liquid chromatography except for the dissolution or this, and the liquid that reacts about this separating medium and this separating medium is combined with support by the chemical approach, mixed solutions, such as n-hexane, various alcohol, and a tetrahydrofuran, are used preferably. Moreover, since the separation property of a compound or an optical isomer may change with eluates, it is desirable to examine the separation property by the mixing ratio of various solvents.

[0016] case where thin-layer chromatography is performed on the other hand 0.1 micrometers - 0.1mm Thickness which consists of a little binder with this separating medium that consists of a particle of extent if required 0.1-100mm What is necessary is just to form a layer in the shape of a support plate. Moreover, in performing membrane separation, it uses as a hollow filament or a film.

[0017]

[Effect of the Invention] The separating medium which makes an active principle the polysaccharide carbamate derivative which has the aromatic series radical which has two or more kinds of different substituents of this invention is effective in separation of various compounds, and its separation is very effective especially in separation of the very difficult optical isomer conventionally. The ether is stronger and the optical isomer which is the object of separation is adsorbed by this separating medium. Especially this separating medium tends to change the separation of a separating medium which consists of a derivative which has a non-substitution product, one corresponding substitution product, or the two same corresponding substituents, and an adsorption property by the substituent, and tends to raise the effectiveness of separation made into the purpose, especially the effectiveness of optical resolution.

[0018] Although relation of the remarkable change and the remarkable substituent of such a separation property cannot be explained completely, a substituent is considered [which giving change and the substituent itself have in the form of a molecule] that the physical and electronic effect which chemical property (polarizability, hydrogen bond nature, polarity, etc.) and a substituent have on the pi-electronic system of an aromatic series ring combines intricately. It became clear to have very effective effect, when a substituent embellishes the separating property of a separating medium by this invention, and the development of the separating medium which has various kinds of properties of it was attained.

[0019]

[0019] It cannot be overemphasized that it is not that by which this invention is limited to these hereafter although an example explains this invention concretely. In addition, parameter k' and alpha which are used in an example are defined as follows.

[0020]
[Equation 1]

$$k' \text{ (容量比)} = \frac{\text{ある光学異性体の保持時間 - デッドタイム}}{\text{デッドタイム}}$$

$$\alpha \text{ (分離係数)} = \frac{\text{より強く吸着される光学異性体の} k' }{\text{より弱く吸着される光学異性体の} k' }$$

[0021] Synthetic microcrystalline cellulose of synthetic example-1 cellulose tris (3-methyl-4-chlorophenyl carbamate) (Merck Co. make) 1.0 g, pyridine 50ml, 3-methyl-4-chlorophenyl isocyanate 9.3g After heating at 100 degrees C for 17 hours, the methanol (500ml) was filled with the reaction mixture. The produced precipitate was dried the RO exception and cellulose tris (3-methyl-4-chlorophenyl carbamate) was obtained. The elemental-analysis value of the cellulose tris (3-methyl-4-chlorophenyl carbamate) obtained the yield of 3.48g is shown below.

calculated value C and 54.33%; H and 3.92%; N, 6.34%; Cl, 16.08% actual measurement C, 53.27%; H, 4.24%; N, 6.28%; Cl and cellulose tris (3-methyl-4-chlorophenyl carbamate) 1.0g obtained in the example -1 of 15.98% examples-1 composition N,N-dimethylacetamide (10ml) It dissolved, and, in addition, distilled off under reduced pressure of a solvent each time in 2 steps to silica gel (DAISO Co., Ltd. make, die sow gel (1000 micrometers of apertures)) 4.0g which processed this by 3-aminopropyl ethoxy silane, and the bulking agent was prepared.

[0022] The silica bead which supported the cellulose tris (3-methyl-4-chlorophenyl carbamate) obtained in the application -1 example -1 was filled up with the slurry method which used the hexane-liquid paraffin (2:1) for the stainless steel column with a die length [of 25cm], and a bore of 0.46cm. Gulliver UV970 was used for Gulliver PU980 by Jasco Industries, and a detector at the high-speed liquid chromatograph machine. The result of having divided various racemic modification was shown in Table 1.

[0023] Synthetic microcrystalline cellulose of synthetic example-2 cellulose tris (3-chloro-4-methylphenyl carbamate) (Merck Co. make) 1.0 g, pyridine 50ml, 3-chloro-4-methylphenyl isocyanate 9.3g After heating at 100 degrees C for 17 hours, the methanol (500ml) was filled with the reaction mixture. The produced precipitate was dried the RO exception and cellulose tris (3-chloro-4-methylphenyl carbamate) was obtained. The elemental-analysis value of the cellulose tris (3-chloro-4-methylphenyl carbamate) obtained the yield of 3.42g is shown below.

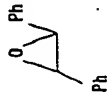
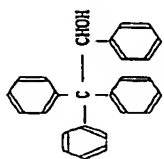
calculated value C and 54.33%; H and 3.92%; N, 6.34%; Cl, 16.08% actual measurement C, 53.14%; H, 4.23%; N, 6.22%; Cl and cellulose tris (3-chloro-4-methylphenyl carbamate) 1.0g obtained in the example -2 of 15.98% examples-2 composition N,N-dimethylacetamide (10ml) Silica gel which dissolved and processed this by 3-aminopropyl ethoxy silane (the Merck Co. make, LiChrospher S14000) In addition, it distilled off under reduced pressure of a solvent each time in 2 steps to 4.0 g, and the bulking agent was prepared.

[0024] The silica bead which supported the cellulose tris (3-chloro-4-methylphenyl carbamate) obtained in the application -2 example -2 was filled up with the slurry method which used the hexane-liquid paraffin (2:1) for the stainless steel column with a die length [of 25cm], and a bore of 0.46cm. Gulliver UV970 was used for Gulliver PU980 by Jasco Industries, and a detector at the high-speed liquid chromatograph machine. The result of having divided various racemic modification was shown in Table 1.

[0025] In order to clarify the -one example effect of the invention of a comparison, the separating medium which made the active principle the cellulose tris (3, 5-dimethylphenyl carbamate) derivative as a comparison article was produced, and the result of the optical resolution to the various racemic modification was shown in Table 1.

[0026]

[Table 1] ラセミ体の光学分割実験結果

ラセミ体	実施例 1		実施例 2		比較例 1	
	k'	α	k'	α	k'	α
トランス-スチルベン オキシド 	0.43(+)	3.25	0.45(+)	2.09	0.74(-)	1.68
1,2,2-テトラフェニル エタノール 	0.73(+)	3.05	0.65(+)	1.95	1.37(+)	1.34

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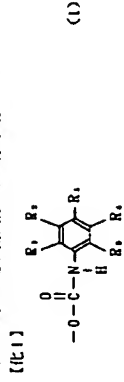
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(54)【発明の名称】 多環の置換芳香族カルバマート誘導体および分離剤

(57)【要約】

【組成】 多環の有する水酸基の80%ないし100%が下記一般式(1)で示される基で置換された多環の置換芳香族カルバマート誘導体、及びこの多環の置換芳香族カルバマート誘導体を有効成分とする分離剤。

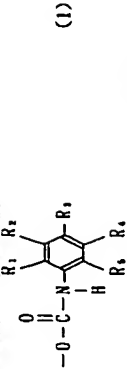


(式中、R₁、R₂、R₃、R₄及びR₅はそれぞれ水酸基または炭素数1ないし8個のアルキル基もしくはハロゲン原子であり、R₁〜R₅のうち少なくとも2つは炭素数1ないし8のアルキル基もしくはハロゲン原子で、かつ置換基である。)

【効果】 本発明の分離剤は各種化合物の分離に有効であり、特に従来の分離剤が非常に困難であった光学異性体の分離に極めて有効である。

芳香族カルバマート誘導体。

【化1】



めて重要な課題となつてゐる。現在までに光学異性体の混合物を分離、即ち光学分割するために、数多くの多環誘導体の光学分割能について研究されてきている。例えばセルローストリスフェニルカルバマート (J. Am. Chem. Soc., 106, 5357, 1984) や、多環のアルキル置換芳香族カルバマート誘導体 (特開昭63-178101号、特開平1-203402号など)、多環のハロゲン置換芳香族カルバマート誘導体 (特開昭61-233633号) を特定相とする液体クロマトグラフィー用固定相が優れた光学分割能を有することがすでに知られている。しかしながら、これら多環誘導体を用いても光学分割できない化合物があることは事實であり、そうした化合物をも光学分割できる分離剤の開発が望まれている。

【0003】
【課題を解決するための手段】 本発明者等は、こうした課題を解決しようと鋭意研究を進めた結果、二價環以上を有する置換芳香族カルバマート誘導体、及びこの多環の置換芳香族カルバマート誘導体が優れた光学分割能を有することを見出し、本発明を完成するに至つた。即ち、本発明は、多環の有する水酸基の80%ないし100%が下記一般式(1)で示される基で置換された多環の置換芳香族カルバマート誘導体、及びこの多環の置換芳香族カルバマート誘導体を有効成分とする分離剤を提供するものである。

【0004】

【化2】

(式中、R₁、R₂、R₃、R₄及びR₅はそれぞれ水酸基または炭素数1ないし8個のアルキル基もしくはハロゲン原子であり、R₁〜R₅のうち少なくとも2つは炭素数1ないし8のアルキル基もしくはハロゲン原子で、かつ置換基である。)

本発明は、天然多環および天然変成多環の何れかを問わず、光学活性の塩化塩の何れかのものである。例示すれば、β-1,4-グルカカン (セルロース)、α-1,4-グルカカン (アミロース、アミロペクチン)、α-1,6-グ


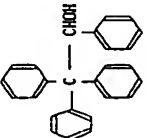


ルカカン、β-1,4-ガラクトサン、β-1,6-グルカカン (ブツツラン)、α-1,6-グルカカン、β-1,3-グルカカン (例えはカードラン、シロフィラン等)、α-1,3-グルカカン、β-1,4-ガラクトサン、β-1,4-マンナン、α-1,6-マンナン、β-1,2-マンナン (マンリン)、β-2,6-フラクトサン (レバソ)、β-1,4-キシラン、β-1,4-キシタン、β-1,4-マンナン、β-1,4-マンキタン (キチン)、プルラン、アガロース、アルギン酸などであり、アミロースを含有する糊粉も含まれる。特に好ましいものは、純度の多環を含むこと

した。
【0025】比較例-1
本発明の効果を明らかにするために、比較品としてセルローストリス(3,5-ジメチルワエニカルバマート)系ラセミ体の光学分割実験結果

単体を有効成分とした分離剤を複製し、その各種ラセミ体に対する光学分割の結果を表1に示した。
【0026】
【表1】

ラセミ体の光学分割実験結果

ラセミ体	実施例1		実施例2		比較例1	
	k'	n	k'	n	k'	n
トランス-スチルベン オキシド 	0.43(+)	3.25	0.45(+)	2.09	0.74(-)	1.68
1,2,2,2-テトラフラフェニル エタノール 	0.73(+)	3.05	0.65(+)	1.95	1.37(+)	1.34